

## REMARKS

The Examiner has rejected claims 1, 2, 4-8, 10-25, 27, 28, and 30-33 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

The Examiner goes on to state that claim 1 recites the limitation “the intermediate orbit” in line 10 and points out that there is insufficient antecedent basis for this limitation in the claim. Applicants have, in accordance with the Examiner’s suggestion, corrected “orbit” to “orbits”, thus obviating this ground of rejection.

The Examiner further states that claim 23 recites the limitation “the intermediate orbit” in line 10 and points out that there is insufficient antecedent basis for this limitation in the claim. Applicants have, in accordance with the Examiner’s suggestion, corrected “orbit” to “orbits”, thus obviating this ground of rejection.

The Examiner has rejected claims 30-32 under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. The Examiner directs Applicants’ attention to MPEP § 2172.01. The Examiner further contends that the omitted structural cooperative relationships are: It is not clear if both minimizing propellant usage and minimizing to achieve final orbit are required by the invention or if they are optional because they are separated by “and/or”.

Applicants respectfully submit that at the recited passage referred to by the Examiner, the claim correctly reads “...and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit;...” Applicants respectfully submit it is clear from a correct reading of the claims that the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit; the “minimize propellant usage and/or time” occurs as a result of steering the thrust vector to provide sufficient solar array power to perform maneuvers and achieve final orbit. Applicants respectfully submit that this reading of the claims does not require minimizing propellant and time in the conjunctive or time in the alternative but both since they are a result of achieving final orbit and not required to achieve final orbit as properly stated in the claims.

The Examiner has rejected claim 32 under 35 U.S.C. 102(b) as being fully anticipated by Porte, “Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft”.

The Examiner submits that Porte discloses launching a spacecraft having chemical and electric propulsion thruster and a solar array on lines 6, section 3.4.3; a processor onboard the spacecraft wherein the processor generates a steering profile that steers a

thrust vector to maintain the illumination of the sun's rays substantially normal to solar arrays of the spacecraft and steers the thrust vector such that the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage or time to achieve orbit on page 2, section 3.2, third paragraph, and page 4, section 3.4.1, paragraph 3.

Applicants respectfully submit that on page 6 of Porte at section 3.4.3 or elsewhere there is neither taught, suggested or implied that there is a "processor onboard the spacecraft wherein the processor generates a spacecraft steering profile onboard the spacecraft that steers a thrust vector  $\Delta V$  to maintain the illumination of the sun rays substantially normal to solar arrays of the spacecraft and steers the thrust vector  $\Delta V$  such that the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize the propellant usage and/or time to achieve final orbit."

Applicants respectfully submit that what is disclosed at the recited passages relied upon by the Examiner is a general discussion of the spacecraft injected on a subsynchronous transfer orbit which the perigee raised by CPS firing up to 15,000 km. It is then stated "The EPS is then operated on an elliptical orbit with increasing semi-major axis until the apogee reaches the geosynchronous altitude. The final circularization is then obtained by CPS firing." Applicants respectfully point out that there is no mention of generating a spacecraft steering profile onboard the spacecraft nor of steering a thrust vector to maintain the illumination of the sun rays substantially normal to the solar arrays of the spacecraft as required by claim 32, element 2. Applicants respectfully submit there is no mention of a solar array whatsoever nor any teaching, suggestion or implication that the thrust vector is steered such that the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit as required by element 2 of claim 32.

The Examiner has rejected claims 1, 2, 4, 6-8, 10-18, 20-25, 27, 28, and 33 under 35 U.S.C. 103(a) as being unpatentable over Porte, p., "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft", in view of Tilley et al, 6,186,446.

The Examiner goes on to state as per claims 1, 6, 7, 8, 10, 11, 14, 15, 17, 18, 20, 21, 22, 23, 24, 25, 27, 28, and 33, Porte discloses launching a spacecraft with chemical and electrical propulsion and a solar array on page 6, section 3.4.3; firing the chemical propulsion at the apogees of the intermediate orbits, starting from the transfer orbit initiated by the launch vehicle, to successively raise perigees of the orbit until the spacecraft perigee substantially clears the Van Allen radiation belts, and where the semi-major axis of the intermediate orbit is substantially less than the semi-major axis of a final orbit, and where

the inclination of the intermediate orbit is substantially greater than the inclination of the final orbit on page 2, section 3.1, strategy 3; firing the electric thrusters to raise the orbit of the spacecraft from the orbit achieved by the chemical thrusters firing step to near geosynchronous orbit by steering the thrust vector both in plane and out of plane while rotating the spacecraft body and steering the solar array to maintain the solar while rotating the spacecraft body and steering the solar array to maintain the sun's illumination on the solar array while not maintaining an earth facing panel on page 2, section 3.1, strategy 3; and selectively firing the chemical thruster to achieve geosynchronous orbit on page 2, columns 1-2; pointing the thrust away from the center of mass is inherent, according to the Examiner.

The Examiner does admit that Porte does not disclose not maintaining the solar array rotation axis aligned with the orbit normal; the thruster firing profile is generated, and the spacecraft can be controlled on-board or from the ground; the step of firing the electric thruster is revised to compensate for disturbances; using momentum wheels; thrusters are differentially fired away from the center of mass for control torque and using thruster on the north and south side of the spacecraft to decrease the duration of the orbit raising phase. The Examiner further submits that Tilley et al teach of not maintaining the solar array rotation axis aligned with the orbit normal on lines 41-55, column 4; the thruster firing profile is generated, and the spacecraft can be controlled on-board or from the ground on line 65, column 2, through line 5, column 3; and the step of firing the electric thruster is revised to compensate for disturbances on lines 2-5, column 3; using momentum wheels on lines 55-57, column 3; thrusters are differentially fired away from the center of mass for control torque and using thruster on the north and south side of the spacecraft to decrease the duration of the orbit raising phase on lines 1-3, column 3; and a throttle back mode on lines 28-29, column 3.

The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Tilley et al in the invention of Porte because such modification would optimize thrust efficiency as disclosed in the background of Tilley et al.

Again, Applicants respectfully point out that although there is a general discussion of spacecraft injected on a subsynchronous transfer orbit with the perigee raised by CPS firing up to 15,000 km, it is stated in Porte "The EPS is then operated on an elliptical orbit with increasing semi-major axis until the apogee reaches the geosynchronous altitude. The final circularization is then obtained by CPS firing." Applicants respectfully submit that this in no way teaches, suggests or implies "firing the chemical propulsion thrusters at apogees of intermediate orbits, starting from the transfer orbit initiated by the launch vehicle, to successively raise perigees of the orbit until the spacecraft perigee substantially clears the

Van Allen radiation belts” as required by element 2 of claim 1. Further, Applicants respectfully point out there is no mention whatsoever of a solar array in this specific strategy and, furthermore, no teaching whatsoever that the spacecraft perigee is raised until it substantially clears the Van Allen radiation belt. Furthermore, Applicants respectfully submit that there is no teaching that the semi-major axis of the intermediate orbits is substantially less than the semi-major axis of a final orbit, nor where the inclination of the intermediate orbits is substantially greater than the inclination of the final orbit as required inter alia by element 2 of claim 1. Applicant further respectfully contends that there is no teaching whatsoever that the inclination of the intermediate orbits is substantially greater than the inclination of the final orbit on page 2, section 3.1, strategy 3, as contended by the Examiner.

On the contrary, Applicants respectfully contend there is disclosed “A possible approach consists in maintaining the standard injection scenario in GTO. After a perigee raising manoeuvre using CP up to a certain altitude, the Electric Propulsion System (EPS) is operated around apogee to raise perigee up to geosynchronous altitude. This approach presents the following inconvenients:...” Further, Applicants contend that although on page 2, section 3.1, strategy 3, there is a discussion of firing electric thrusters to raise the orbit of spacecraft from the orbit achieved by the chemical thrusters firing step to near geosynchronous orbit, there is no suggestion, teaching or implication that such a maneuver should be employed by “steering the thrust vector both in-plane and out-of-plane while rotating the spacecraft body and steering the solar array to maintain the sun’s illumination on the solar array” as required by element 3 of claim 1.

Applicants further respectfully contend that although on page 2, section 3.1, strategy 3, there is taught “The EPS is then operated continuously on an elliptical orbit with increasing semi-major axis until the apogee reaches the geosynchronous altitude. The circularization is then obtained with CP. The inclination correction is shared between the two CPS burns and the EPS transfer phase in order to maximize the BOL mass.”, there is no specific teaching of firing selected ones of the chemical and electric propulsion thrusters to achieve final geosynchronous orbit as required inter alia by element 4 of claim 1. Again, although Applicants respectfully submit that they do not necessarily agree that pointing the thrust away from the center of mass is inherent, this does little to cure the above-noted deficiencies.

Applicants gratefully acknowledge, as the Examiner admits, Porte does not disclose not maintaining the solar array rotation axis aligned with the orbit normal; the thruster firing profile is generated, and the spacecraft can be controlled on-board or from the ground; the step of firing the electric thruster is revised to compensate for disturbances; using momentum wheels; thrusters are differentially fired away from the center of mass for

control torque and using thruster on the north and south side of the spacecraft to decrease the duration of the orbit raising phase.

Applicants respectfully submit that in Tilley et al in column 4, lines 41-55, there is disclosed a generated series of adjustment instructions designed to maintain the attitude of satellite with the sun vector in the xz plane. "With these constraints, the thruster vector 8 is continuously adjusted to its optimum direction through the transition orbits, while the solar array control 13 operates to rotate the solar array to compensate for the attitude adjustments. The array 6 is positioned perpendicular to the sun vector 19." Applicants respectfully submit that although this recitation teaches "the array 6 is positioned perpendicular to the sun vector 19", there is no teaching, suggestion or implication of steering the solar array to maintain the sun's illumination on the solar array "by steering the thrust vector both in-plane and out-of-plane while rotating the spacecraft body" as required by element 2 of claim 1.

Applicants respectfully submit that at line 65, column 2, of Tilley et al there is disclosed "The attitude control module 10 receives current attitude data from inertial reference sensors 11 and compares it to the mission profile specified by ground controller 12....Attitude control module 10 calculates attitude adjustments and actuates the appropriate mechanism to accomplish the adjustment." Applicants respectfully contend that in Tilley et al the inertial reference sensors 11 are seen to be on-board and Tilley et al possesses an attitude control module 10 as seen at column 2, lines 55 et seq. "which is part of the onboard computer system 20." Applicants respectfully submit they are at a loss to understand how this teaching suggests, as the Examiner contends, that the spacecraft can be controlled on-board or from the ground, relying on line 65, column 2 of Tilley et al.

Applicants respectfully submit that at column 3, lines 2-5 of Tilley et al there is recited "Attitude control module 10 calculates attitude adjustments and actuates the appropriate mechanism to accomplish the adjustment." Applicants are at a loss to understand how this in any way teaches, suggests or implies "firing the electric propulsion thrusters to raise the orbit of the spacecraft from the orbit achieved by the chemical propulsion thrusters firing step to near geosynchronous orbit..." as required by element 3 of claim 1 or by "firing selected ones of the chemical and electric propulsion thrusters to achieve final geosynchronous orbit" as required by element 4 of claim 1, nor do Applicants discern how this in any way teaches, suggests or implies the method in claim 1 wherein the step of firing the electric propulsion thrusters to raise the orbit of the spacecraft is periodically revised to compensate for disturbances experienced by the spacecraft as required by claim 11.

Applicants respectfully submit that at lines 55-57 of column 3 of Tilley et al there is disclosed "Momentum wheels 15 are used for this purpose in the preferred embodiment of

“this invention.” Applicants respectfully submit that this does little to teach, suggest or imply the patentable subject matter of claim 17 which is set out as follows: “The method recited in Claim 1 wherein the step of firing the electric propulsion thrusters to raise the orbit of the spacecraft comprises adjusting attitude steering profiles using a plurality of momentum wheels.”

Applicants respectfully submit that at line 67 of column 2 through line 3 of column 3 of Tilley et al there is disclosed “Attitude may be adjusted by a series of adjusters which may include chemical thrusters 2-4, EPS thrusters 5, and momentum wheels (not shown).”

Applicants respectfully disagree that this teaches, as the Examiner contends, that thrusters are differentially fired away from the center of mass for control torque and using thruster on the north and south side of the spacecraft to decrease the duration of the orbit raising phase as required by claims 18, 19, 20 with regard to pointing the resultant thrust vector away from the center of mass or, with regard to the north or south side of the spacecraft, are “used to increase the effective thrust and decrease the duration of the electric orbit raising phase to raise the spacecraft from the orbit achieved by the chemical propulsion thrusters firing step to near geosynchronous orbit” as required by claim 22.

Applicants respectfully submit that at lines 28-29 of column 3 of Tilley et al there is recited “It is understood that, for the purpose of this invention, it may be feasible to vary the EPS thrust magnitude.” Although Applicants are at a loss to discern how this in any way relates to a throttle back mode as set out in claim 14, Applicants respectfully contend this does little to cure the remainder of the deficiencies as recited above with regard to claim 1 which are hereby respectfully incorporated by reference.

Applicants therefore respectfully disagree that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the teachings of Tilley et al in the invention of Porte because such modification would optimize thrust efficiency as disclosed in the background of Tilley et al.

Applicants further respectfully conclude that it is not at all feasible to assume that one of ordinary skill in the art would be motivated to combine the teachings of Porte and Tilley et al as suggested by the Examiner, there being no suggestion in either reference to do so and, although both teach in the satellite area, one is directed to solar array control for electric propulsion systems employing on-board computers while the other relates to benefits of electric propulsion for orbit injection of communication spacecraft devoid of any disclosure of steering the solar array to maintain the sun’s illumination on the solar array as required by inter alia claim 1, but merely indicates that the “solar arrays must be fully deployed and permanently oriented towards the sun.”

Although Porte generally discloses the use of solar arrays, Porte does not teach, suggest or imply, for example, in claim 1 steering the solar array to maintain the sun's illumination on the solar array; in claim 8 to maintain the illumination of the sun's rays substantially normal to the solar array; in claim 10 to maintain the illumination of the sun's rays substantially normal to the solar array; steering the solar array to maintain the sun's illumination on the solar array as required in claim 23; to maintain the illumination of the sun's rays substantially normal to the solar arrays of the spacecraft in claim 25; maintain the illumination of the sun's rays substantially normal to solar array as in claim 28; steering the solar array to maintain the sun's illumination on the solar array while not maintaining the solar array rotation axis aligned with the orbit normal and while not maintaining an Earth facing panel wherein the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power as in claim 30; steers the thrust vector such that the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit as in claim 31; maintain the illumination of the sun's rays substantially normal to solar arrays of the spacecraft and steers the thrust vector such that the thrust vector is not normal to the axis of the solar array and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit as in claim 32; steering the solar array to maintain the sun's illumination on the solar array as required in claim 33.

The Examiner goes on to state as per as per claim 2, Porte discloses the thrust vector is maintained substantially normal to the axis of the solar array and the sun is normal to the solar array on page 2, column 2, paragraph 3 in section 3.2.

Applicants respectfully contend that at page 2, column 2, paragraph 3 in section 3.2 there is disclosed "In order to cope with the high power requirements of EP, the solar arrays must be fully deployed and permanently oriented towards the sun. The spacecraft must also orient the thruster along its velocity. The only flight configuration compatible with these two requirements is a three axis configuration with the solar array rotation axis aligned with the orbit normal."

Applicants respectfully submit that the spacecraft must also orient the thruster along its velocity and does not teach the thrust vector is maintained substantially normal to the axis of the solar array as required inter alia in claim 2, nor is there a clear teaching that the sun is maintained substantially normal to the solar array as required in claim 2 but, as the reference teaches, that "the solar array rotation axis aligned with the orbit normal." Applicants further respectfully contend that claim 2 has been shown to be patentably

distinguishable over Porte for the reasons recited above with regard to claim 1 which are hereby respectfully incorporated by reference.

The Examiner goes on to state as per claim 4, Porte discloses that the transfer orbit is subsynchronous on page 2, section 3.1, strategy 3.

Applicants respectfully submit that on page 2, section 3.1, strategy 3, although it is stated "The spacecraft is injected on a subsynchronous transfer orbit", this does little to cure the deficiencies as recited above with regard to claim 1, from which claim 4 depends, which are hereby respectfully incorporated by reference.

The Examiner goes on to state as per claims 12 and 13, Porte discloses a hybrid propulsion system to use both chemical and electric propulsion to achieve a final geosynchronous orbit in Figure 1, strategy 3, and in section 3.4.3.

Applicants respectfully submit in Figure 1, strategy 3, and in section 3.4.3 there is disclosed "the EPS is operated continuously on an elliptical orbit, instead of a circular orbit which is more favourable for inclination correction. The spacecraft is injected on a subsynchronous transfer orbit. An apogee manoeuvre is performed to raise the perigee outside the radiation belt in order to avoid significant degradations of the solar arrays. The EPS is then operated continuously on an elliptical orbit with increasing semi-major axis until the apogee reaches the geosynchronous altitude. The circularization is then obtained with CP. The inclination correction is shared between the two CPS burns and the EPS transfer phase in order to maximize the BOL mass. Figure 1 summarizes the three injection scenarios defined above."

Although Applicants do not necessarily agree that strategy 3 in Figure 1, Section 3.4.3 use both chemical and electric propulsion to achieve a final geosynchronous orbit as shown in Figure 1, nevertheless claims 12 and 13 have been shown to be patentably distinguishable over Porte for reasons recited above with regard to claim 1 which are hereby respectfully incorporated by reference.

The Examiner goes on to state as per claim 16, Porte discloses firing the electric propulsion thrusters to raise the orbit of the spacecraft comprises pre-planned electric thruster coast periods that are selectively shortened or lengthened in duration to compensate for disturbances on page 2, column 2.

Applicants respectfully submit that on page 2, column 2, there is neither taught, suggested or implied firing electric propulsion thrusters to raise the orbit of the spacecraft comprising pre-planned electric thruster coast periods that are selectively shortened or lengthened in duration to compensate for disturbances experienced by the spacecraft as relied upon by the Examiner and, furthermore, claim 16 has been shown to be patentably distinguishable over Porte for reasons recited above with regard to claim 1 which are hereby respectfully incorporated by reference.



The Examiner has rejected claim 19 under 35 U.S.C. 103(a) as being unpatentable over Porte, p., "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft", in view of Tilley et al 6,186,446 as applied to claims 1, 18 and 23 above, and further in view of Hosick et al 6,032,904.

The Examiner goes on to state that Porte and Tilley et al disclose all the limitations as set forth above. According to the Examiner, Porte and Tilley et al do not disclose using gimbals to point the thrust or differential thrust away from the center of mass to provide control torque. Further, the Examiner states that Hosick et al teach using gimbals to point the thrust or differential thrust away from the center of mass to provide control torque at lines 49-51, column 7. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use these teachings of Hosick et al in the invention of Porte and Tilley et al because they are the conventional ways to control spacecraft. The Examiner concludes that gimbaled thrusters are known as a way to reduce the necessary number of thrusters needed and to get the most thrust with the least amount of fuel because differential thrust can be reduced.

Applicants respectfully submit that in Hosick et al at column 7, lines 49-51 there is merely disclosed "A secondary benefit of gimbaled electric thruster devices 22 is that it can be used to unload momentum stored in the momentum wheels 40 as described later." Applicants respectfully submit that this teaching directed to unloading momentum stored in momentum wheels does not in any way suggest, teach or imply the limitation as set out in claim 19 requiring gimbals be used to point the thrusters away from the center of mass of the spacecraft to provide control torque. Furthermore, Applicants respectfully submit that claim 19 has been shown to be patentably distinguishable over Porte and Tilley et al for those reasons recited above with regard to claims 1, 18 and 23 above which are hereby respectfully incorporated by reference. As recited above Hosick et al does little to cure the deficiencies of this rejection.

Applicants therefore respectfully disagree that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use these teachings of Hosick et al in the invention of Porte and Tilley et al because they are the conventional ways to control spacecraft and, further, that gimbaled thrusters are known as a way to reduce the necessary number of thrusters needed and to get the most thrust with the least amount of fuel because differential thrust can be reduced as contended by the Examiner.

The Examiner has rejected claim 5 under 35 U.S.C. 103(a) as being unpatentable over Porte, p., "Benefits of Electrical Propulsion for Orbit Injection of Communication Spacecraft", in view of Tilley et al 6,186,446 as applied to claim 1 above and further in view of Spitzer et al 5,595,360.

The Examiner states that Porte and Tilley et al disclose the limitations set forth above. Further, the Examiner admits that Porte and Tilley et al do not disclose the transfer orbit is supersynchronous. The Examiner goes on to say that Spitzer et al teach of using a transfer orbit that is supersynchronous at lines 65-67 of column 6. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a supersynchronous orbit because such modification would provide longer burn time for raising perigee and decreasing inclination as stated on lines 1-5, column 7 of Spitzer et al.

Applicants respectfully submit that in Spitzer et al column 7, lines 1-5 there is disclosed "For example, in a subsynchronous orbit, a perigee raising burn may last six out of 10 hours versus nineteen out of 22 hours for a supersynchronous orbit. Accordingly, the time of the burn for raising perigee 72 lasts longer and raises perigee 72 faster." Applicants respectfully submit that this teaching does not suggest, teach or imply the transfer orbit is supersynchronous as required by claim 5 which embraces the method recited in claim 1. Furthermore, Applicants respectfully submit that claim 1 has been shown to be patentably distinguishable over Porte and Tilley et al for reasons recited above with regard to claim 1 which are hereby respectfully incorporated by reference and Spitzer et al does little to cure the deficiencies of this rejection.

Applicants gratefully acknowledge the indicated allowability of claims 30 and 31 if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, set forth in this Office Action.

As previously recited, Applicants respectfully submit that at the recited passage referred to by the Examiner, the claim correctly reads "...and the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit;..." Applicants respectfully submit it is clear from a correct reading of the claims that the thrust vector is steered to provide sufficient solar array power to perform maneuvers and minimize propellant usage and/or time to achieve final orbit; the "minimize propellant usage and/or time" occurs as a result of steering the thrust vector to provide sufficient solar array power to perform maneuvers and achieve final orbit. Applicants respectfully submit that this reading of the claims does not require minimizing propellant and time in the conjunctive or time in the alternative but both since they are a result of achieving final orbit and not required to achieve final orbit as properly stated in the claims.

Applicants respectfully contend that in view of the above remarks and amendments all the claims presently under prosecution have been shown to contain patentable subject matter and to be patentably distinguishable over the prior art of record, Porte, Tilley et al, Hosick et al and Spitzer et al, alone or in any combination.

Accordingly, Applicants respectfully request that this application be reviewed and reconsidered in view of the above remarks and amendments and that a Notice of Allowance be issued at an early date.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "AW Karambelas". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

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